

# Reorganize IMS Databases With No Outage

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## TRUE 24 X 7 AVAILABILITY

Administration of IMS full-function and HALDB databases can have a significant impact on the overall performance and usability of critical business applications. One component of database administration is reorganization. Reorganization must be performed to modify the database schema, to reclaim physical disk space, and (most importantly and most frequently) to maintain acceptable database performance.

Some installations reorganize IMS databases on a set schedule, whether the databases need to be reorganized or not. Unnecessary reorganizations are costly in resources and time. Many installations have a set of databases that rarely or never get reorganized because there is no batch window. Because these databases are reorganized infrequently, if at all, performance suffers and causes costly delays.

IMS DBAs need tools that enable continual availability and that reorganize “just enough, just in time.”

In the past, database reorganizations were time consuming and costly because the database was forced offline for reorganization and/or shadow databases were required. The entire database had to be reorganized even if only a small portion of it was disorganized. BMC Online/Defrag reorganizes just enough of your databases, just in time. It enables you to target the disorganized portion of your database and improve performance while the database remains online and available for processing.

## BMC ONLINE/DEFRAG

Online/Defrag (included with BMC MAXM Reorg/Online and BMC MAXM Reorg/EP with Online/Defrag Feature) revolutionizes the concept of IMS database reorganization. Online/Defrag reorganizes a database while the database remains online and available for updates. It provides increased availability and performance for IMS databases that require continual or near-continual availability. Online/Defrag can reorganize a single database record or an entire database with:

- » No downtime
- » Minimal user interaction
- » Concurrent updates

Online/Defrag provides reorganization functions for HDAM, HIDAM, PHDAM, and PHIDAM databases that are experiencing performance problems caused by record fragmentation. An analysis component enables you to target a reorganization to only those areas within the database that need to be reorganized. Moreover, Online/Defrag recommends the reorganization parameters that will reduce I/O activity the most.

Online/Defrag lets you reorganize a single logical record, a group of records, or the entire database without affecting the function of business applications. The process requires absolutely no downtime; your IMS full-function and HALDB databases remain available 24x7.

The primary goal of Online/Defrag is to increase the efficiency of I/O. Online/Defrag works in a way that is similar to a PC hard disk defrag process. It analyzes each database record to see how many blocks the record spans and compares this number to the minimum number of blocks required to hold the entire record. If the difference between the existing block count and the minimum block count exceeds a user-defined threshold, Online/Defrag defragments the record - it consolidates the root and all of its dependent segments to contiguous blocks. If the threshold is not exceeded, the record is not consolidated.

Figure 1 shows a record that spans six database blocks. Analysis of the database record indicates that the minimum number of blocks that the record requires is three. If reorganization parameters specify an expected block improvement of 50 percent, the Online/Defrag Record Analysis will recommend Record 1 for reorganization.

## Record 1 Before Record Mode Reorganization

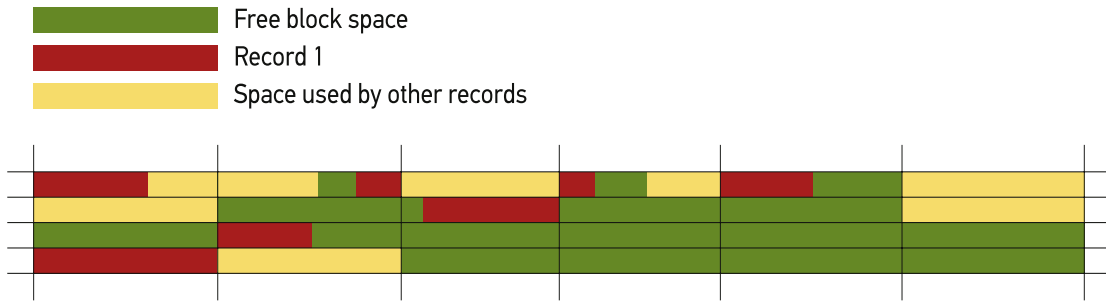


Figure 1. Record 1 before Record Mode Reorganization

Figure 2 shows Record 1 after reorganization. Record 1 was relocated to three adjacent target blocks. The expected block improvement of 50 percent was satisfied. Record 1 spans half the number of blocks that it spanned before reorganization. Accessing Record 1 after the reorganization requires fewer I/Os, which increases database performance.

Space used by other records

## Record 1 After Record Mode Reorganization

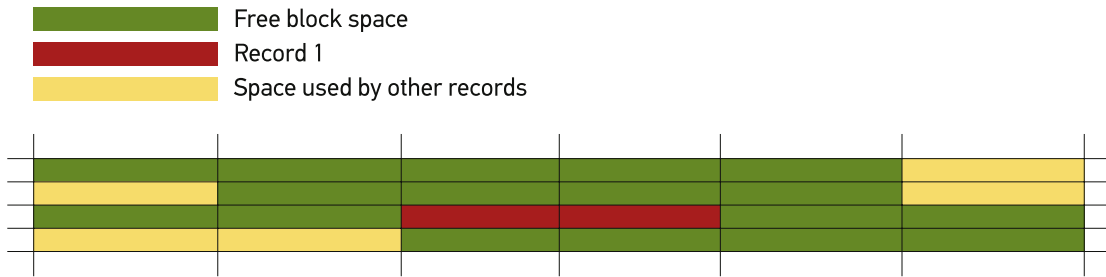


Figure 2. Record 1 after Record Mode Reorganization

Some database records may have more activity (updates) than other records; the greater the activity, the greater the disorganization. Identifying and reorganizing only those records that are substantially disorganized maximizes efficiency of database reorganization and improves overall database performance.

### RESTART LOGIC

With Online/Defrag, the database defragmentation process can be interrupted and restarted automatically. Restart logic lets you run Online/Defrag on a regular basis, regulating its execution on any combination of the following conditions:

- » Number of records to process during this execution
- » Amount of time that is available for this execution
- » Execution terminates at a predefined time

When multiple conditions are present, execution terminates when the first condition is met.

Regardless of how Online/Defrag is interrupted, the next time it starts, it begins at its previous position in the database. This restart capability allows for the process to be divided into smaller units of work that do not conflict with other database activities. Database reorganization can be moved from the traditional weekend utility window to a nightly batch cycle or to daytime processing.

## RESOURCE CONSUMPTION

All processing modes of Online/Defrag execute as BMPs. Because all processing modes use IMS to interface with a database, data integrity is ensured. Online/Defrag runs as a BMP, so all change activity to the database is logged, including the work being performed by Online/Defrag. Online/Defrag performs a simple sync point call after each processed root to free resources and to release any locks that are held. Even when Online/Defrag processing has been interrupted and has not completed, the database is always in a state where it can be image-copied, recovered, or otherwise processed normally.

## ONLINE/DEFRAG IN PRACTICE

Many times, a relatively small amount of data (perhaps 10 percent), that is used by an IMS application causes most (if not all) of the physical I/O that is caused by data fragmentation. A traditional reorganization must deal with the entire database rather than just the data that is causing a performance problem. By using Online/Defrag, you can maintain optimal database performance with far less computing resources than required for traditional database reorganizations.

When a traditional reorganization is required, you can run Online/Defrag before the reorganization to significantly reduce the resources required and the duration of the traditional reorganization.

## PROCESSING MODES

Online/Defrag has three distinct processing modes:

- » **Record:** Analyze logical records — based on selected root keys — and defragment (if necessary)
- » **Scan:** Scan the entire database, analyze each record, and defragment (if necessary)
- » **Block:** Defragment the entire database; no analysis is performed. Every record in the database is defragmented. The end result is similar to the result of a traditional offline reorganization, except that data set extents taken before initial allocation are not reclaimed.

## EXTRACT

For optimal efficiency, run the extract process before executing the Scan or Record modes. The extract process reads and analyzes all records in the database. It runs as a batch job that processes the database as read-only.

- » For Record mode, the extract process analyzes the database and builds a data set of selected root keys.
- » For Scan mode, the extract process provides an optimal set of runtime parameters.

Because Block mode rewrites all database records, it cannot take advantage of any extract processing.

## RECORD MODE

Because Record mode uses the least amount of IMS resources, consider using it for most of your processing. The only portion of the job that runs as a BMP is the actual defragmentation by using GU calls. The extract runs outside the IMS region, consuming very few resources. You can use Record mode in two ways:

For databases that you are intimately familiar with, build your own keys-in file. Use a regularly scheduled, daily job to process a subset of the keys-in file, based on the number of records or wall clock time.

On a regular frequency, such as every other week or monthly (depending upon change activity in the database), run an extract and build a keys-in file. Then use a regularly scheduled, daily job to process a subset of the keys-in file, based on the number of records or wall clock.

## SCAN MODE

When you would like to analyze a database but you don't have the time to run the extract ahead of time, consider having Online/Defrag scan the database record by record and defragment the records that need it. Because the reads must take place through IMS, this method consumes more resources and runs longer than an extract followed by Record mode processing.

## BLOCK MODE

In some very rare instances, you may want Online/Defrag to process every record in your database. During processing, Online/Defrag defragments every record in the database. Unlike a traditional reorganization, the end result may not have the records in physical sequence.

This method is similar to IBM HALDB online reorganization because it moves every record in the database and logs each move. This is the most expensive mode of Online/Defrag. One example for using Block mode would be to reorganize a root-only HIDAM database when the probability of I/O from root to root becomes too high.

## WHY DEFRAG?

Online/Defrag provides the following benefits:

- » 24x7 availability of data: Downtime can be costly, even when it is planned and scheduled. Because absolutely no downtime is required for database reorganization with Online/Defrag, your applications can be available around the clock.
- » Help with meeting SLAs: IMS database performance typically degrades over time as fragmentation occurs. Frequent Record mode defragmentation with Online/Defrag will keep a database in its optimal state.
- » Improved transaction response times: Because your database is being reorganized continually, applications find the data they need quickly, with fewer I/Os than would be required if the database were badly disorganized.
- » Extended time between traditional reorganizations: When Online/Defrag reorganizes records, it keeps segments adjacent. This delays the need for a traditional reorganization that requires some downtime.
- » Faster processing for a BMC MAXM Reorg/Online reorganization: Complete database reorganization will run more quickly because many database segments will already be adjacent.
- » Faster processing for a traditional offline reorganization: The unload is improved by segment adjacency.
- » No required shadow data set: Traditional reorganizations require a large window of downtime. BMC MAXM Reorg/Online reorganizations require a very small amount of downtime (usually less than one minute), but they require additional DASD for the creation of a shadow data set during reorganization. IBM HALDB online reorganizations require duplicate DASD space for the duration of the database reorganization. Online/Defrag does not require a shadow data set; reorganization is performed "in place."
- » Flexibility of the maintenance schedule (allowed by restart capability): Reorganization can be broken into small daily increments. Reorganization can be scheduled to run each day when the database is not being accessed heavily by other IMS applications.

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